

CHAPTER 3

WATER SOURCE SELECTION

3-1. General. The selection of a water supply will be based on available quantity, quality, and cost of development. Investigate usable fresh surface water and groundwater thoroughly, prior to consideration of sources requiring desalination. When fresh water sources do not exist, consider saline water sources. The most commonly used parameter to differentiate between saline water qualities is total dissolved solids (TDS). The total dissolved solids is defined as the sum of the dissolved organic materials and the inorganic salts. Fresh waters contain less than 1,000 milligrams per liter of total dissolved solids. Brackish water contain 1,000-20,000 milligrams per liter of total dissolved solids. Sea water usually contains at least 20,000 milligrams per liter of total dissolved solids. Quantities of potable water needed will be determined by an analysis of the site in accordance with TM 5-813-1. The quantity of saline feed water necessary to produce the required quantity of product water is addressed in Chapter 4.

3-2. Quality. The quality will be determined by the planned use. Physical, chemical, and bacteriological testing of source waters are required to determine the level of treatment to supply the necessary water quality. When the quantity withdrawn exceeds the recharge rate, quality inherently decreases; therefore, this must be considered during design.

a. Physical characteristics. The physical characteristics of the raw water source that must be evaluated are total suspended solids (TSS) and temperature. Turbidity and silt density index (SDI).

(1) *Total suspended solids.* The total suspended solids level of raw water sources must be evaluated to determine the level of pretreatment processes required. Raw water having low total suspended solids levels generally requires less pretreatment. The source with the lowest total suspended solids is preferred.

(2) *Temperature.* The temperature of the raw water source must be matched to the specific desalination process. In extreme cases, the water temperature may control the desalination process selection. A climatological survey must be made prior to finalization of process selection to determine the seasonal maximum and minimum water temperatures of the proposed water sources.

(3) *Turbidity and silt density index.* These two characteristics provide two different measures of the amount of fine particulate matter in the water. Turbidity is measured in nephelometric turbidity units (a measure of the amount of light scattered by a known water sample thickness). Silt density index is a measure of the amount of 0.45-micron filter plugging caused by passing a sample of water through the filter for 15 minutes. Turbidity must be determined for all desalination processes. Also, the silt density index must be determined for water being considered for reverse osmosis treatment.

b. Chemical constituents. The chemical constituents of the raw water must be determined to provide information for treatment selection. Appendix B shows the water testing analyses required for desalination treatment.

c. Bacteriological quality. The bacteriological testing of the raw water must include a type of a coliform indicator organism count. Procedures for filter membrane, most probable number fermentation tube, and standard plate count, coliform organism bacteriological testing techniques can be found in Standard Methods for the Examination of Water and Wastewater and TB Med 576. Manufacturers' recommendations as to the media and procedures used to identify microbiological activity detrimental to the operation of a particular desalination system shall be followed.

3-3. Selection versus rejection of potential raw water sources. After the completion of physical, chemical, and bacteriological testing, a final water source may be selected. Extreme care must be taken in the selection of a source where the usage rate is greater than the recharge rate. In most cases, selection will involve choosing the brackish water with the lowest level of total dissolved solids. When brackish water is not available, use sea water or water as saline as sea water as the feed water source. When the coliform indicator organism count of a water is greater than 10,000 most probable number (MPN), then the water source should be rejected for sanitary reasons and a more saline water chosen (per Standard Methods for the Examination of Water and Wastewater and TB MED 576). If other water is available, a water containing more than 1,000 nephelometric turbidity units should be rejected on the basis of the high cost and difficulty of

clarification, even if the alternative water is more saline. When the total delivery pumping pressure of a less saline water is greater than the operating pressure of a reverse osmosis system, then the desalination of the more saline water by reverse osmosis may be more economical than the combined cost of delivery and

desalination of the less saline source. The final selection of a raw water source will be based on economic studies. In some cases, the decision cannot be made until all systems are fully designed and life cycle costed.